DEMAND OF FOREST LAND USE ON MANAGING FOREST RESOURCES WITH THE COMMUNITY (PHBM) SYSTEM

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ABSTRACT

This study aimed to analyze demand of forest land use on Pemalang Forest District (*Kesatuan Pemangkuan Hutan* or KPH), Central Java Indonesia. This analysis used demand theory. According to Marshall all demanded goods must have a price (Pindyck and Rubinfeld, 2001). Managing Forest Resources with the Community (*Pengelolaan Sumberdaya Hutan Bersama Masyarakat* or PHBM) system was designed to anticipate or prevent potential interference with the forest and the region, especially the act of logging without responsibility (illegal logging). Thus, if the PHBM system was not implemented by Perum Perhutani (a state owned company managing the area), so Perum Perhutani being disadvantage, because the illegal logging higher and higher was conducted by forest villagers. With the PHBM system, the forest village communities represented by local community organizations (*Lembaga Masyarakat Desa Hutan* or LMDH) could utilize forest land by paying the land rent without money but paid in the form of opportunity cost (income sacrificed) was not acceptable to steal wood and Perum Perhutani accepted of opportunity cost (income sacrificed) was LMDH did not steal wood and Perum Perhutani losses could be minimized. As Amarendra study (2009) offers a proxy price (rent) the opportunity cost of land.

The study was conducted in KPH Pemalang with 43 LMDH. Estimated research model was formulated in the form of Multiple Linear Regression, with the dependent variable was land-use demanded, while the independent variable was the price or rent of land that proxied by opportunity cost as much as the stealing wood, value of the harvest and sharing.

The results showed that sharing variables have a stronger influence on land that used by LMDH. Price elasticity of demand forest land use was $\varepsilon h < 1$, which means that the elasticity of demand is in-elastic. This indicates that the percentage change in the area of forest land was used by LMDH smaller than the change percentage in prices that was proxied by sacrificed income or levels timber theft. Thus LMDH not responsive to the reduction in the chance to steal wood. Sacrificed incomes were smaller (down one thousand rupiahs) would cause an increase in demand for land use under $1m^2$, meaning that the Perum Perhutani policy in reducing illegal logging becomes ineffective. Therefore, efforts were needed to increase the elasticity of demand forest land use by Perum Perhutani.

Key words: demand of forest land use, opportunity cost , elasticity.

Introduction

Forest as a national development capital has tangible benefits to the lives and livelihood of the Indonesian nation, whether ecological, social and economic, in a balanced and dynamic. For that forests should be managed and maintained, protected and sustainably utilized for the welfare of the Indonesian people, both now and in the coming generations. In his position as one of the determinants of life support systems, forests have been of great benefit to mankind, and therefore must be preserved. Forests have a role as a counterweight and compatible with the global environment, so that linked with the international community to be very important, continued prioritizing the national interest.

The problem always occurs in the exploitation activities and forest management in Indonesia was logging without responsibility (illegal logging) in the form of a tree on a small scale theft and looting the forests on a large scale in unison. The series result of various actions that harm the forest area was the potential of forest resources continue to diminish drastically. In the past five years (1998-2003) the mass looting of forest activities was increasing, the rate of decline in production occurred an average of 8.4 percent, so the potential reduction in timber production reached 13 million cubic meters per year. The period of high forest plunder actions also caused due to low timber production was below the average 100 cubic meters per hectare (Perhutani Reports, 2004).

The problem was of course affected the low capacity of the forest in its function as a guarantor of a stable ecosystem processes. System management of Forest Resources with the Community, which would then be abbreviated PHBM, considered very important to realize. As a new paradigm, PHBM is an alternative solution-which is expected to solve problems affecting forests in Indonesia. Prum Perhutani must be proportionate "share" power in access and control of forest resources. PHBM system actually closer to the symbiotic mutualism between Perum Perhutani and the community. The concept of mutual benefit in maintaining forest goodness

Perum Perhutani benefit is the reduction of illegal logging and so that the forests can be maintained, so that the cost of care and maintenance of forest decline and economic benefits of forest utilization can be achieved. LMDH, representing forest villagers in the process of cooperation with Perum Perhutani can utilize forest land, so LMDH benefits is cultivated crops and sharing for thinning and final felling staple crops (standing) without pay with money as rent of land.

Marshall demand functions was equation: $Qx = f(Px, Py, I)$. Number Qx (quantity demanded) may change as a result of changes in variables Px (item price itself), Py (other goods prices) and I (income) (Pindyck and Rubinfeld, 2001), meaning that all items requested must have a price. LMDH in utilizing forest land, did not pay the price (rent) of land with money, but lost the opportunity to steal wood. Therefore, the price (rent) of land is proxied by sacrificed income (opportunity cost), since deciding to choose to use the land and did not choose to do illegal logging. As Amarendra study (2009) offers a proxy price (rent) the opportunity cost of land.

Other variables that affect forest land use was the ability of the land to produce crops and selling price or revenue (Arlyn R. Maligaya and Fred C. White,1989; Colwell and Dilmore, 1999; Fatmata John, Oscar Cacho and Graham Marshall, 2000; Peter J. Parks, Ian W. Hardie, Cheryl A. Tedder and David N. Wear, 2000; Othman Jamal, 2003; Banzhaf H. Spencer, 2006; Jumbe and Angelson, 2006; Elizabeth Kopits, Virginia

McConnel dan Margaret Walls, 2008; Wei-Chun Tseng and Chi-Chung Chen, 2009; YU Hao-Wei, SONG Fang and LI Xiao Hong ;2009). Jumbe and Angelson (2006) and Pamela Jagger (2008) add the sharing variable or profit sharing, as the additional revenue derived not from the main crop cultivated farmers.

The previous research have been conducted concluded that the positive effect of income on demand for land (Peter J. Parks, Ian W. Hardie, Cheryl A. Tedder and David N. Wear, 2000; Othman Jamal, 2003; Wei-Chun Tseng and Chi-Chung Chen, 2009); YU Hao-Wei, SONG Fang and LI Xiao Hong; 2009), while the results of research and Angelson Jumbe (2006), concluded that income negatively affect demand for land.

Jumbe and Angelson (2006) in researching the benefits of a policy or joint forest management program in Malawi concluded that the variables that influence participation in land used such as the age of household head, education level, family size, sex ratio (female versus male) revenue, the revenue (sharing), and the distance of the forest and products market. However, the study results suggest that the revenue from the forest sector (sharing) is negatively correlated with the participation of land utilization. In Liwonde, people who participate in this program actually decreased income 112-195%.

Pamela Jagger study (2008) about the income of the sector after the reform of the forestry sector in Uganda by using cross section data from 46 villages covering 640 respondents, concluded that reform of the forest makes sharing forest revenues did not increase. In the forest Bugoma sharing income for the poorest households fell by 10.7 per cent significant at 10 percent level. Budongo Forest in sharing household income for the poorest 15 percent fell significantly at the level of 10 percent.

Sunderlin study (2005) on poverty and forest reform in developing countries, concluded that the profit sharing (sharing) of forest a positive influence on the use of forest land, but relatively few people are willing to live in the jungle, because they tend to be poor and tend to be the poorest of the poor. The trend of poverty due to the profit sharing was received relatively minor. Some of the things that led to the outcome (sharing) was low: 1) very low product innovation, 2) agricultural and forest sustainability, and 3) Increased in agricultural output only on land that has been provided and were not in the area of new land; 4) powerlessness to increase revenue and improve the quality of forest management.

The variables that affect demand for Indonesian forest land use in this study is the demand of forest land use as the dependent variable, while the independent variables are the price or rent of land is proxied by the opportunity cost. Other variables that affect land used was the ability of the land to produce crops and selling price (revenue) and sharing the results of thinning and final felling the sale of staple crops forest

Illegal logging still takes place and caused due to low production of timber and vacant land in state forests was managed by Perum Perhutani significantly from year to year, not decreased despite routinely performed reforestation activities. Illegal logging and forest exploitation that ignore sustainability, resulting in the destruction of forest resources was priceless, ruin people's lived and lost timber, the loss of biodiversity and environmental services that could be produced from forest resources. PHBM system had contributed to the result of food being enjoyed LMDH through intercropping and crop land use under the stands, as well as sharing the results of thinning and final felling, but the land was offered Perum Perhutani not fully was utilized by LMDH. This shows the need for the

study of factors affecting the demand of forest land use. Specifically, the research questions that will be further investigated (1) What are the factors that influence the demand for forest land used? (2) How does the elasticity of demand for forest land used?

Originality or authenticity that differentiates it from previous studies: (1) Estimates made against groups or LMDH, which has not been done by previous researchers. Previous research conducted individually (Fatmata John, Oscar Cacho and Graham Marshall, 2000; Peter J. Parks, Ian W. Hardie, Cheryl A. Tedder and David N. Wear, 2000; Othman Jamal, 2003). (2) Price variable is proxied by the opportunity cost. Previous studies measured the rental price of land with money (Arlyn R. Maligaya and Fred C. White, 1989; Colwell and Dilmore, 1999; Fatmata John, Oscar Cacho and Graham Marshall, 2000; Peter J. Parks, Ian W. Hardie, Cheryl A. Tedder and David N. Wear, 2000; YU Hao-Wei, SONG Fang and LI Xiao Hong, 2009).(3) This study uses a combination of data, time-series and cross section data, while previous researchers only use time-series data (Arlyn R. Maligaya and Fred C. White, 1989; Colwell and Dilmore, 1999; Othman Jamal, , 2003; H. Spencer Banzhaf, 2006; Jumbe and Angelson, 2006) or only cross-section data (Fatmata John, Oscar Cacho and Graham Marshall, 2000; Peter J. Parks, Ian W. Hardie, Cheryl A. Tedder and David N. Wear, 2000; Elizabeth Kopits, Virginia McConnell and Margaret Walls, 2008; Wei-Chun Tseng and Chi-Chung Chen, 2009; YU Hao-Wei, SONG Fang and LI Xiao Hong, 2009).(4) This study aimed to predict the factors that affect the demand of forest land used, which previously had not been done by previous researchers in Indonesia. (5) Estimated demand of land use was more oriented programs that involve community participation. Previous studies more oriented toward profit maximization (Arlyn R. Maligaya and Fred C. White, 1989, and Elizabeth Kopits, Virginia McConnell and Margaret Walls, 2008) and costs minimizing (Fatmata John, Oscar Cacho and Graham Marshall, 2000; Peter J. Parks, Ian W. Hardie, Cheryl A. Tedder and David N. Wear, 2000; Othman Jamal, 2003).

Methodolody

The research location was the forest area in KPH Pemalang, Central Java Indonesia. The sampling method of this study with purposive sampling approach. The sampling technique was based on the consideration of certain considerations align with the goals of the study (Masri, 1995). Considerations are used in LMDH sampling includes: There was illegal logging in LMDH, LMDH obtain yields of land utilized, LMDH receive Sharing for the results of thinning and final felling from 2005 – 2010

Pemalang district has 45 LMDH, but two LMDH were LMDH Glandang village in Slarang forest sub-district (*Bagian Kesatuan Pemangkuan Hutan* or BKPH) and LMDH Mugi Lestari Karanganyar village in BKPH Jatinegara did not include in the study, because its have not been obtained sharing. Thus, the number of samples to be 45-2 = 43 LMDH X 6 years = 258 observations.

Operational definitions and measurements of each variable was used to facilitate the introduction of variables in the model, both the dependent variable and independent variables, which included: (1) Request for land use was the area of land that has been LMDH utilized. Land in this study was cropping land and under the stand which was used by pesanggem in each LMDH in every year from 2005 to 2010 in units of m2, (2) Price or rent of land to be paid or the sacrificed incomes that must be made to get the benefit of the

land. In this study the price calculated at the opportunity cost. Opportunity cost was the income that is sacrificed as a result of choosing a particular alternative (Mulyadi, 2002). Opportunity cost is the cost of goods or services measured by the loss of the sacrificed alternative uses for producing a good or service (Nicholson, 2002). Opportunity cost in this study as the sacrificed income by LMDH, and was accepted by KPH Pemalang as payment for land use was calculated by the amount of illegal logging in each LMDH in every year from 2005 to 2010 in thousands of dollars, (3) Harvest Value, used as a proxy for income from land use by LMDH. LMDH will conduct land use requests, if the land is used to produce and harvest could be used for subsistence. Harvest value was calculated by summing the results of multiplying the amount of production of various commodities were produced on the price of commodities in each LMDH in each year from 2005 to 2010 in thousands of dollars, (4) Sharing is part of forest revenue was received by LMDH from the sale of staple crop, the staple crops such as thinning and final felling, because LMDH utilize the land under forestry major tree stands. The land area utilized forest farmers were used to calculate the portion or share of income. Sharing was calculated from the results of thinning and final felling received by LMDH, every year from 2005 to 2010 in thousands of dollars

Research data collection was conducted using secondary data and primary data. Secondary data was collected with engineering documentation, records and study of existing statistical data. Documentation is a way to collect data through written documents, such as archives, books about the opinions, theories, laws relating to the research problem (Arikunto, 2006). Documentation or literature studies done by taking data from Pemalang district and related agencies such as NGOs, Forestry, Perum Perhutani, and other relevant agencies as well as from journals and publications or other relevant materials. Primary data was sourced from two representatives from each pesanggem in LMDH, chairman and secretary or treasurer of each LMDH, foreman companion PHBM systems, BKPH Assistant, KPH Pemalang Administrator and interested parties, especially those related to the implementation of PHBM systems. The primary data used for the analysis and discussion of research results.

Analysis techniques were adjusted the purpose of research. The first objective of this research using panel data regression analysis techniques include regression techniques to the entire BKPH and KPH Pemalang. The second objective, data analysis techniques to calculate the elasticity of demand for all BKPH and KPH Pemalang. Estimated demand function of land use were analyzed by Multiple Linear Regression and a few other tests required between test suitability model (goodness of Fit), the classical assumption of deviation detection test, tests of significance both land use demand model simultaneous significance test (F test), tests of significance partial (t test), and different test with chow test.

The analysis was conducted at KPH Pemalang and each of BKPH in order to determine the behavior of each BKPH and LMDH. By geography, topography and different socio-economic and behavioral differences are possible LMDH in land use and expected to contribute to the decision making for each BKPH. Mathematical form of multiple linear regression to be estimated for the purpose of the first study was formulated as follows:

$$QD = \alpha 0 + \alpha 1 \text{ Price} + \alpha 2 \text{ Vaha} + \alpha 3 \text{ Sharing} + e \quad \ldots\ldots\ldots\ldots\ldots \quad (1)$$

QD = Request for land use
Price = Price or rent of land was proxied by the opportunity cost as level timber theft
Vaha = value is the sum of the value of crop harvest the entire crop
Sharing = the result of thinning cutting funds akhit staple crops
e = Disturbance error
and α1, α 2, and α 3 are the regression coefficients of each independent variable. The sign of the coefficient was expected of each model are: α1 <0, α 2> 0 α 3> 0

The model that has been analyzed to be tested if the quality is good or not good to test the goodness of fit of the two models were made, by calculating the coefficient of determination which is denoted by R^2. Classical assumption test was also performed for the regression model needs to consider the existence of irregularities on the classical assumption, because in essence if the classical assumptions are not met then the variables that describe will be inconsistent. Assuming deviation detection classical assumptions that must be met are normality, autocorrelation free, heteroskedasticity free and multicollinearity free.

Elasticity analysis was used to measure the impact of changes in the independent variables were calculated using the formula:

$$e_h = \frac{\%\partial Q}{\%\partial P} = \frac{\partial Q / Q}{\partial P / P} = \frac{\partial Q}{\partial P}.\frac{P}{Q} \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \qquad (2)$$

$\frac{\partial Q}{\partial P}$ is the coefficient of the regression equation and $\frac{\bar{P}}{\bar{Q}}$ is the average of the variable P divided by the average of the variable Q (Koutsoyiannis, 1994 and Pindyck and Rubinfeld, 2001).

Elasticity values are as follows (Koutsoyiannis, 1994):

1. Price elasticity, called:
    a. Elasticity, if ε> 1
    b. In-elastic, if ε <1
    c. Unitary, if ε = 1
2. Income elasticity suggests that:
    a. If εp <0, is called an inferior
    b. If 1> εp> 0, is called a normal goods
    c. If εp> 1, the so-called luxury goods, Elasticity values were as follows Koutsoyiannis (1994)
3. Price elasticity, called:
    a. Elasticity, if ε> 1
    b. In-elastic, if ε <1
    c. Unitary, if ε = 1

Background

Opportunity cost

Cost is the sacrifices made to hold, establish, or do something to get the goods and services or produce goods and services, expressed by a unit of money according to the

prevailing market price. Opportunity costs or the cost of lost opportunities occur because human needs are not limited and resource is constraints. Opportunity costs are not always in the form of money must be spent, but rather a sacrifice that must be faced by every economic agent when making economic decisions. This is what requires people to be rational in determining the resources owned various options to satisfy the necessities of life (Espenshade, 2005).

Opportunity costs that arise as a consequence of choices made. opportunity cost describe explicit and implicit costs related with the use of some resource in a particular way. In this context, the cost of not just money but also paid alternatives sacrifices that may arise from an activity (Sugiarto, et al, 2005). Opportunity cost is revenue or cost savings are sacrificed as a result of choosing a particular alternative (Mulyadi, 2002) Opportunity cost is the cost of goods or services measured by the loss of the sacrificed alternative uses for producing a good or service (Nicholson, 2002). Cost Opportunity are the things sacrificed to get what they want. In this study, the price or rent of land that should be paid by LMDH an implicit cost, because LMDH not make a cash payment, but the payment of the price or rent of land is revenue which is sacrificed form of stealing wood in the forest.

The previous Research

Researchs on land demand until now, basically focused on the study of market analysis on land. The factors that determine the demand for land, among others:

1. Price or rent of land (Arlyn R. Maligaya and Fred C. White, 1989; Colwell and Dilmore, 1999; Fatmata John, Oscar Cacho and Graham Marshall, 2000 H. Spencer Banzhaf, 2006; Elizabeth Kopits, Virginia McConnell and Margaret Walls , 2008).
2. Price of production (Arlyn R. Maligaya and Fred C. White, 1989; Fatmata John, Oscar Cacho and Graham Marshall, 2000; Ianchovicina B., R. Darwin and R. Shoemaker, 2001; Ahammad H and R. Mi, 2005).
3. Income, is market value of the crop or market value of crops sold (Peter J. Parks, Ian W. Hardie, Cheryl A. Tedder and David N. Wear, 2000); agricultural production quantities (Jamal Othman, 2003); revenue from admission type (Wei-Chun Tseng and Chi-Chung Chen, 2009); net income of rural household (YU Hao-Wei, SONG Fang and LI Xiao Hong; 2009),
4. Sharing or profit sharing (Pamela Jagger, 2008; Jumbe and Angelson, 2006).
5. Other factors, such as distance field to market output (Colwell and Dilmore, 1999; Jumbe and Angelson, 2006; Patil, KM and Dinesh K. Marothia, 2009), soil type, soil productivity indices and soil structure (Colwell and Dilmore, 1999), crops costs of production and population density (Peter J. Parks, Ian W. Hardie, Cheryl A. Tedder and David N. Wear, 2000); family size, income and the proportion of Cultivating in annual net income (YU Hao-Wei, SONG Fang and LI Xiao Hong (2009), economic development, the advancement of agricultural science and technology development and population growth (QIAO Rui-bo, LI Ping Yu and CAI Yun-Long, 2009 Alla Golub and Thomas W. Hertel, 2008).

Description of KPH Pemalang

KPH Pemalang was an enterprise-grade teak forest 24423.40 hectares, which consists of Forest Production (HP): 19780.50 hectares; Debt Protection or nature (SA): 30.70 hectares and Limited Production Forest (HPT) or Forest Conservation: 4612.20 hectares. The number of villages in forest areas KPH Pemalang was 45 villages with a population of 229,510 people, with the male gender 48.75 percent and 51.25 percent with the female gender. Of 229,510 souls is 48.72 percent of the population are children of school age and 40.54 per cent and 10.74 per cent of working-age non-productive age. In terms of jobs, the majority of livelihood as farmers amounting to 75.93 per cent, 19.71 per cent of trade.

PHBM was socialized in KPH Pemalang at 2002, and established a model PHBM village in 6 LMDH. In 2003 established 20 PHBM villages and in 2004 was formed 19 PHBM villages. Thus, 100% or 45 villages around the forest has signed cooperation agreements with KPH Pemalang.

Variables characteristic that influence demand of land is used by LMDH

Characteristics of variables that describe a direct relationship to the demand of land use are land price as opportunity cost or sacrificed income for timber theft rate, income includes the value of the harvest and sharing. The characteristics of each BKPH and KPH can be explained in table 1:

Table 1:
Description analysis of KPH Pemalang and BKPH entire KPH Pemalang

KPH/BKPH	Minimu	Maximum	Mean	Std.Dev.	Skewness	Kurtosis	Obs
Supply of land used by Perum Perhutani (m^2)							
Pemalang	169.000	10.891.000	2.366.740	2.317.678	1,625	2,256	258
Sokawati	169.000	6.827.000	2.334.259	1.915.558	0,613	-0,817	54
Bantarsari	237.100	3.664.000	1.335.242	846.731	0,657	-0,339	66
Slarang	262.000	9.458.000	2.183.033	2.702.998	1,737	1,981	30
Cipero	219.000	9.756.000	3.434.066	2.944.478	0,804	-0,594	30
Kedungjati	664.400	10.360.000	3.586.697	2.183.170	1,333	2,289	36
Jatinegara	292.000	10.891.000	2.681.095	2.745.448	1,611	1,837	42
Demand of land used by LMDH (m^2)							
Pemalang	46.000	2.405.000	603.329	497.072	1,343	1.065	258
Sokawati	124.000	2.050.000	693.500	500.206	0,740	-0,463	54
Bantarsari	46.000	1.791.000	415.030	373.240	2,102	4,361	66
Slarang	73.000	2.134.000	400.366	397.668	3,049	12,254	30
Cipero	156.000	2.405.000	915.966	697.296	0,550	-1,058	30
Kedungjati	282.000	1.916.000	760.861	474.434	1,355	0,79	36
Jatinegara	143.000	1.611.000	569.928	405.199	1,177	0,274	42
Land Price (Rp.000)							
Pemalang	2.690	14.981	7.719	2.353	0,237	0.51	258
Sokawati	2.696	10.983	7.519	1.837	-0,169	-0,444	54
Bantarsari	2.690	11.775	8.317	2.201	-0,823	0.052	66

Slarang	4.250	14.981	8.795	2.452	0,656	1,092	30
Cipero	4.090	9.900	6.990	1.376	-0,207	0,038	30
Kedungjati	4.509	9.956	7.207	1.494	-0,242	-1,122	36
Jatinegara	4.007	13.894	7.699	2.686	0,935	0,065	42
Value of the harvest (Rp.000)							
Pemalang	103.725	7.222.961	1.754.537	1.474.187	1,369	1,235	258
Sokawati	315.033	6.427.713	1.935.574	1.422.445	0,868	0,206	54
Bantarsari	103.725	5.277.272	1.209.134	1.138.336	2,071	4,016	66
Slarang	169.074	6.326.858	1.180.070	1.192.383	2,964	11,675	30
Cipero	470.782	7.222.961	2.705.609	2.086.378	0,557	-1,054	30
Kedungjati	748.259	5.774.426	2.256.173	1.420.701	1,338	0,812	36
Jatinegara	355.205	4.843.548	1.679.858	1.221861	1,156	0.252	42
KPH/BKPH	Minimu	Maximum	Mean	Std.Dev.	Skewness	Kurtosis	Obs
Sharing (Rp.000,00)							
Pemalang	4.873	273.246	69.358	57.849	1,323	0,925	258
Sokawati	12.597	233.795	76.549	56.953	0,811	-0,348	54
Bantarsari	4.873	200.990	46.572	42.329	2,100	4,305	66
Slarang	8.238	240.801	45.255	44.902	3,041	12,192	30
Cipero	17.230	273.246	109.793	80.111	0,398	-1,270	30
Kedungjati	32.745	218.666	86.553	54.125	1,356	0,802	36
Jatinegara	14.300	224.983	69.511	51.882	1,300	0,928	42

Source: Processed data , 2010

Basing on Table 1, the percentage of land use is offered as table 2 below:

Table 2:
The Percentage of Land Use is Offered

KPH / BKPH	Land area is used by LMDH (m^2)	Land area is offered by Perhutani (m^2)	Land use is offered (%)
Pemalang	2.405.000	10.891.000	22,08
Sokawati	2.050.000	6.827.000	30,02
Bantarsari	1.791.000	3.664.000	48,88
Slarang	2.134.000	9.458.000	22,56
Cipero	2.405.000	9.756.000	24,65
Kedungjati	1.916.000	10.360.000	18,49
Jatinegara	1.611.000	10.891.000	14,79

Source: Processed data , 2010

Estimated Demand of Forest Land Use

Estimated demand for forest land in the region as a whole KPH Pemalang and each BKPH used model: Qd = f (Price, Vaha, Sharing), where: Qd: the area of forest land used, Price = price or rent land is proxied by opportunity cost at the level of illegal logging, Vaha = Value of the harvest, Sharing = sharing. The estimation of land area utilized by LMDH in KPH Pemalang and each BKPH presented in Table 3.

Tabel 3:

Factors Affecting Land Use Demand in KPH Pemalang

Independent variable	KPH Pemalang	BKPH					
		Sokawati	Bantarsari	Slarang	Cipero	Kedungjati	Jatinegara
Constant	40.610,126**)	122.926,73**)	31.299,841**)	8.815,505*)	62.265,520**)	21.630,001*)	25.587,726***)
Price	-4,059*)	-12,009*)	-2,636*)	-0,838*)	-6,080*)	-2,104*)	-1,846*)
Value of the harvest	0,233***)	0,043**)	0,045***)	0,056**)	0,341***)	0,068**)	0,335***)
Sharing	2,669***)	7,535***)	7,541***)	7,364***)	-0,247**)	6,942***)	-0,060
Dependent variable : Demand of land use by LMDH							
R^2	0,967	0,974	0,999	1,000	0,999	1,000	0,999
$F_{statistik}$	2.514,267	624,594	28.934,994	52.737,644	11.317,576	39.052,963	9.872,436
Prob.(F_{stat})	0,000	0,000	0,000	0,000	0,000	0,000	0,000
DW	2,440	1,794	1,722	2,890	2,216	2,478	1,579
N	258	54	66	30	30	36	42

Source: Processed data , 2010

note: ***) significant α = 1% **) significant α = 5% *) significant α = 10%

Model Suitability Test (Goodness of Fit)

From calculations using the SPSS statistical R2 values obtained for 0.967; 0.974; 0.999, and 1, which means that 96.7%, 97.4%, 99.9% and 100% of the land area variable used by LMDH be explained by variations (set of) variable prices, value of the harvest and sharing. While the rest of 3.3%, 2.6% and 0.1% explained by variations in the factors or other variables outside the model. With the high value of R2 is equal to 96.7%, 97.4%, 99.9% and 100% the better the quality of the model, as more and may explain the association between dependent and independent variables.

Violation Detection Test Assumptions Classic

Deviation Detection Test Results Assumptions Classical Model Land Use Demand in Region KPH Pemalang is presented by table 4:

Table 4:
Test Results Assumptions Classical Model

No	KPH/BKPH	Normality	Autocorrelation	Heteroskedasticity	Multicollinearity
1	KPH Pemalang	Not	Negative Autocorrelation	Have	No
2	BKPH Sokawati	Normal	None Autocorrelation	Free	No
3	BKPH Bantarsari	Not	NotneAutocorrelation	Free	No
4	BKPH Slarang	Not	Negative Autocorrelation	Free	No
5	BKPH Cipero	Normal	None Autocorrelation	Free	No
6	BKPH Kedungjati	Normal	Non be concluded	Free	No
7	BKPH Jatinegara	Normal	Non be concluded	Free	No

Demand Elasticity of Forest Land Used

Elasticity of demand is calculated by the formula

$$e_h = \frac{\%\partial Q}{\%\partial P} = \frac{\partial Q / Q}{\partial P / P} = \frac{\partial Q}{\partial P}.\frac{P}{Q} \qquad \text{.....} \qquad (2)$$

$\frac{\partial Q}{\partial P}$ is the coefficient of the regression equation and $\frac{\bar{P}}{Q}$ is the average of the variable P divided by the average of the variable Q (Koutsoyiannis, 1994 and Pindyck and Rubinfeld, 2001).

Elasticity of demand for forest land use by LMDH in KPH Pemalang and each BKPH presented in Table 5.

Tabel 5 :

Elasticity of demand for forest land use by LMDH in KPH Pemalang

	KPH	BKPH					
	Pemalang	Sokawati	Bantarsari	Slarang	Cipero	Kedungjati	Jatinegara
∂Qd/∂P	-4,059	-12.009	-2,636	-0,838	-6,08	-2,104	-1,846
Price Average	7.719	7.519	8.317	8.795	6.990	7.207	7.699
Demand Average	603.329	693.500	415.030	400.366	915.966	760.861	569.928
Elasticity of Demand Price	-0,0519309	-0,1302028	-0,0528241	-0,0184086	-0,0463982	-0,019,9294	-0,0249371
∂Qd/∂VH	0,233	0,043	0,045	0,056	0,341	0,068	0,335
Value of the harvest Average	1.754.537	1.935.574	1.209.134	1.180.070	2.705.609	2.256.173	1.679.858
Demand Average	603.329	693.500	415.030	400.366	915.966	760.861	569.928
Elasticity of value of the harvest	0,67758573	0,12001396	0,13110144	0,16505877	1,00725646	0,20163967	0,98740969
∂Qd/∂SH	2,699	7.535	7,541	7,364	-0,247	6,942	
Sharing Average	69.358	76.549	46.572	45.255	109.793	86.553	
Demand Average	603.329	693.500	415.030	400.366	915.966	760.861	
Elasticity of Sharing	0,31023811	0,83171841	0,84620256	0,83238292	-0,0296068	0,78969867	

Table 5 explains that the price elasticity of demand forest land use KPH Pemalang across BKPH shows εh <1, which means that the elasticity of demand is in-elastic. This indicates that the percentage change in the area of land used by LMDH smaller than the percentage change in prices proxied by sacrificed income levels be or timber theft. Thus LMDH not responsive to the reduction in the chance to steal wood. Revenues were sacrificed smaller (down 1,000, 00) will cause an increase in demand for land use under 1m2, meaning that the policy Perum Perhutani in reducing illegal logging becomes ineffective. Therefore, efforts are needed to increase the price elasticity of demand by Perum Perhutani.

Several factors influence the price elasticity of demand, among others (Ari, 2004): Availability of substitutes, The more and better substitutes on the market tends to be greater the price elasticity for the commodity. Substitute forest land use, for example in the form of land use outside the forest area or work outside the forest area as well as other jobs in the forest area in addition to farming. Therefore, it needs to be investigated substitutes. Total use of goods, The greater number of possible uses of a product, the greater the coefficient of elasticity of demand. In order to increase the value of price elasticity of demand, it is necessary to use other than forest land for planting crops.

The results, as Table 5 also found that the elasticity of demand for land use by LMDH in KPH Pemalang and in BKPH (except BKPH Cipero) to the value of the harvest and sharing shows 1> εp> 0, which means that land use is a normal (normal goods) or goods essential for LMDH. This means that if the value of the harvest and sharing increases, will drive demand for land use has also increased although with a smaller percentage of the increased value of crops or sharing. Increased demand for land use, crop and enhance the value of sharing and to support economic growth in KPH Pemalang.

One of the factors affecting income elasticity (Ari, 2004) is the dimension of time, in general, the nature of consumer demand to meet the needs in the future (its needs can be delayed) is elastic. While demand for the fulfillment of its current need or financing needs can not be postponed is in elastic. Therefore, to increase the elasticity of the value of crops, Perum Perhutani effort is needed to increase the value of the harvest for LMDH. In general, the value of the harvest during the study period of the crop obtained from the stands or intercropped staple crop was planted until the age of 3 years. Opportunities forest land stands above the age of 3 years with the development of medicinal plant cultivation needs to be done (Halidah, et al., 2007 and Serafinah, et al., 2011). Interviews with representatives LMDH, generally argue that the cultivation of medicinal plants, especially *porang* crops (Amorphophallus oncophillus) has been tested by KPH Pemalang, but there is no cooperation with pharmaceutical companies as the market, which can help increase revenue and improve LMDH.

The elasticity of demand for land use in BKPH LMDH Cipero the value of harvest showed εp> 1, is elastic. This means that the land is a luxury item for members LMDH in BKPH Cipero. The increase in the value of a given crop BKPH Cipero LMDH increasing demand will drive land use, this means the value of the harvest could push up demand for land use, and can increase consumer surplus and support economic growth in KPH Pemalang. Interviews with representatives Pesanggem in BKPH Cipero said BKPH Cipero land area is very fertile land for crops, especially maize and also said that the benefits of the corn crop in each growing season can be used to buy a motorcycle. This is

confirmed by the average value of crop BKPH Cipero an average of the highest yields in comparison with the rest of the region BKPH Pemalang KPH and also strengthened by sharing coefficient -0.247 indicating that land use BKPH Cipero more due to higher value crops well, compared with the acceptable sharing. The results of interviews with representatives Pesanggem states that received LMDH sharing more widely used to build public facilities, however, they stated that if the construction of public facilities needs are met, then allow the sharing sharing is also used for productive

Similarity Test Behavior LMDH

Tests performed to determine the behavioral similarities both variable regression equations, but with two different objects made with chow test. Test for equality in this study are grouped based on the location of the adjacent BKPH. Determining the location of the adjacent, because the adjacent BKPH lets have the same characteristics or behavior.Grouping BKPH as follows:

a. BKPH Bantarsari with BKPH Slarang
b. BKPH Cipero with BKPH Sokawati
c. BKPH Kedungjati with BKPH Jatinegara

Test LMDH behavioral similarities in BKPH Bantarsari and BKPH Slarang, by regression of the combined BKPH Bantarsari and BKPH Slarang and obtained S1 (RSSBan-Slar), perform regression obtained BKPH Bantarsari and S2 (RSSBan), and perform regression obtained BKPH Slarang and S3 (RSSSlar). Calculation results are as follows:

S1 (RSSBan-Slar) = 7,998,555,214.37
S2 (RSSBan) = 6,462,891,188.93
S3 (RSSSlar) = 753.58.427,93
S4 (or S2 + S3 RSSur) = 7,216,419,616.86 with df = (n1 + n2 - 2k)
S5 (S1-S4) = 782,135,597.52
F table = 2.70
Behavioral similarities test results = 3.6850> 2.70

From the test results were then compared behavioral similarities between the F and F count table where the results show that the F count> F table. Thus the hypothesis that the demand for land use regression BKPH Bantarsari is no different to the regression in BKPH Slarang rejected. This suggests that there are differences in the area of land be used by LMDH in BKPH Bantarsari and BKPH Slarang. This difference is shown by the difference in behavior that be utilizes by LMDH in BKPH Bantarsari and forest land utilizing by LMDH in BKPH Slarang. To BKPH Bantarsari forest land use demand estimates are empirically is as follows:

QD = 31299.841-2.636 Price + 0.045 Vaha + 7.541 Sharing, while for BKPH Slarang land use demand estimation model empirically are as follows:

QD = 8815.505-.838 Price + 0.056 Vaha + 7.364 Sharing

Price or rent of forest land is proxied by sacrificed income rose by 1,000, 00 LMDH land area utilized in BKPH Bantarsari will decrease by 2.636 m2, while the area of land used LMDH in BKPH Slarang will decrease by 0.838 m2. This suggests response to changes in the price or rent of land or sacrificed income in BKPH Bantarsari dramatically higher than in BKPH Slarang. The difference in response was corroborated by the average income is sacrificed in BKPH Slarang larger than the average income is

sacrificed in BKPH Bantarsari (Rp.8.795.000> Rp.8.317.000 in table 1). Furthermore, the response area of land used for the rise in the value of crop BKPH Slarang greater than the response of land that used on the increase in the value of crop BKPH Bantarsari. The difference in response was corroborated by the average value of crop LMDH in BKPH Bantarsari larger than the average value of crop LMDH in BKPH Slarang (Rp 1,209,134,000> Rp. 1,180,070,000 in Table 1). Therefore, the average income is sacrificed in BKPH Bantarsari smaller than the average income in BKPH Slarang sacrificed due to the average value of the larger harvest BKPH Bantarsari compared with the average value of the harvest in BKPH Slarang.

Response LMDH land area utilized on sharing in BKPH Bantarsari larger than BKPH Slarang, as indicated by the value of elasticity (7.541> 7.364). The difference in response was corroborated by the average share LMDH in BKPH Bantarsari larger than average share LMDH in BKPH Slarang (Rp.46.572.000> Rp. 45,255,000 in table 1). The average share of this higher average sustained by stealing a lower chance at BKPH Bantarsari. The results of the combined regression calculation BKPH Cipero and BKPH Sokawati obtained S1 (RSSCi-So), regression obtained BKPH Cipero S2 (RSSCi), and the regression obtained BKPH Sokawati S3 (RSSSo).

S1 (RSSCi-So) = 2,752,608,117,940.40
S2 (RSSCi) = 344,658,778,957.07
S3 (RSSSo) = 10,789,453,858.53
S4 (or S2 + S3 RSSur) = 355,448,232,815.60 with df = (n1 + n2 - 2k)
S5 (S1-S4) = 2,397,159,885,124.80
F table = 2.72
Behavioral similarities test results = 175.3452> 2.72

From the test results were then compared behavioral similarities between the F and F count table where the results show that the F count> F table. Thus the hypothesis that the demand for land use regression BKPH Cipero is no different to the regression in BKPH Sokawati rejected. This suggests that there are differences in the area of land used by LMDH in BKPH Cipero and BKPH Sokawati. This difference is shown by the difference in behavior LMDH utilizing forest land in BKPH Cipero and LMDH that utilize forest land in BKPH Sokawati. To BKPH Cipero forest land use demand estimates are empirically is as follows:

QD = 62265.520-6.080 Price + 0.341 Vaha - 0.247 Sharing , while for BKPH Sokawati land use demand estimation model empirically are as follows:

QD = 122,926.73 - 12.009 Price + 0.043 Vaha + 7.535 Sharing

Price or rent of land is proxied by sacrificedincome rose one thousand rupiahs land area utilized by LMDH in BKPH Cipero will decrease by 6.080 m^2, while the area of land used by LMDH in BKPH Sokawati will decrease by 12.009 m^2. It showed a response to changes in the price or rent of land or sacrificed income in BKPH Sokawati dramatically higher than in BKPH Cipero. The difference in response was corroborated by the average income is sacrificed in BKPH Sokawati larger than the average income is sacrificed in BKPH Cipero (Rp.7.519.000> Rp.6.990.000 in table 1). Furthermore, the response area of land used for the rise in the value of crop BKPH Cipero greater than the response of land that used on the increase in the value of crop BKPH Bantarsari. The difference in response was corroborated by the average value of crop LMDH in BKPH Cipero larger than the average value of crop LMDH in BKPH Sokawati (Rp

2,705,609,000> Rp. 1,935,574,000 in table 1). Therefore, the average income is sacrificed in BKPH Cipero smaller than the average income in BKPH Sokawati sacrificed due to the average value of the larger harvest BKPH Cipero compared with the average value of the harvest in BKPH Sokawati.

Sharing Increase in BKPH Sokawati one thousand rupiahs LMDH likely to increase the area of land used in BKPH Sokawati, as shown by the increase in the land area used LMDH of 7.535, while the area of land used for LMDH in BKPH Cipero tend to fall, it This is indicated by the decline in the land area used LMDH in BKPH Cipero of 0.247 m^2. This means that the higher the share received LMDH in BKPH Sokawati, the area of land used LMDH, while for BKPH Cipero less land area utilized LMDH. Land use in BKPH Cipero more due to better crop value, compared with an acceptable sharing.

The results of the combined regression calculation BKPH Kedungjati and BKPH Jatinegara obtained S1 (RSSKed-Ja), regression obtained BKPH Kedungjati S2 (RSSKed), and the regression obtained BKPH Jatinegara S3 (RSSJa).

S1 (RSSKed-Ja) = 18,646,037,426.54
S2 (RSSKed) = 2,151,178,908.66
S3 (RSSJa) = 8,625,858,535.40
S4 (or S2 + S3 RSSur) = 10,777,037,444.06 with df = (n1 + n2 - 2k)
S5 (S1-S4) = 7,868,999,982.48
F table = 2.74
Behavioral similarities test results = 17.5239> 2.74

From the test results were then compared behavioral similarities between the F and F count table where the results show that the F count> F table. Thus the hypothesis that the demand for land use regression BKPH Kedungjati is no different to the regression in BKPH Jatinegara rejected. This suggests that there are differences in the area of land used by LMDH in BKPH Kedungjati and BKPH Jatinegara. This difference is shown by the difference in behavior that utilizes LMDH in BKPH Kedungjati forest land and forest land utilizing LMDH in BKPH Jatinegara. BKPH Kedungjati forest land use demand estimates are empirically is as follows:

QD = 21630.001-2.104 Price + 0.068 Vaha + 6.942 Sharing, while for BKPH Jatinegara land use demand estimation model empirically are as follows:

QD = 25587.726-1.846 Price + 0.335 Vaha

Price or rent of land is proxied by sacrificed income rose one thousand rupiahs land area utilized by LMDH in BKPH Kedungjati will decrease by 2.104 m^2, while the area of land used by LMDH in BKPH Jatinegara will decrease by 1.846 m^2. It showed a response to changes in the price (rent) of land or income sacrificed in BKPH Kedungjati dramatically higher than in BKPH Jatinegara. The difference in response was corroborated by the average income is sacrificed in BKPH Jatinegara larger than the average income is sacrificed in BKPH Kedungjati (Rp.7.699.000> Rp.7.207.000 in table 1). Revenues were sacrificed at BKPH Jatinegara larger than the income sacrificed in BKPH Kedungjati corroborated by the average value of crop LMDH in BKPH Kedungjati larger than the average value of crop LMDH in BKPH Jatinegara (Rp 2,256,173,000> Rp. 1679 .858.000 in table 1). This is caused by the condition of the land in BKPH Jatinegara good for forest plants (teak), but less fertile for crops. By contrast, in BKPH Kedungjati more fertile for crops, so the value of the harvest to be higher when compared to BKPH Jatinegara

Sharing variable is significant at BKPH Kedungjati, but not significant in BKPH Jatinegara. This means that if the sharing is received by LMDH in BKPH Kedungjati one thousand rupiahs the area of land used by LMDH in BKPH Kedungjati increased by 6.942 m^2. While the area of land used by LMDH in BKPH Jatinegara not affected by any received sharing because sharing is not a major concern for LMDH in BKPH Jatinegara.

Conclusion

Price or rent of land with Opportunity cost was proxied by the level of illegal logging significant negative effected on land that used LMDH in KPH Pemalang and around BKPH in KPH Pemalang. This negative relationship indicated that when sacrificed incomes rose, demand of forest land utilized by LMDH down, otherwise if the opportunity to steal timber was smaller, as well as tighter control of public awareness, the demand for forest land was increasing. As the relationship between demand and price in the theory of demand. As previous research was conducted by Arlyn and Fred (1989); Colwell and Dilmore (1999); Fatmata (2000); Banzhaf (2006); Elizabeth Kopits et al. (2008); Wei-Chun Tseng and Chi-Chung Chen, (2009) and Patil and Dinesh (2009).

Value of the harvest siginficant positive influenced on land that used by LMDH. Land area was used LMDH positively and significantly related to the value of the harvest. This result showed when the value of the harvest up, demand for forest land used by LMDH will be rose. Vice versa, when the value of the harvest fell, demand of forest land for agricultural used would also go down, as the relationship between income and demand for land in the theory of demand. As previous research conducted by Wei-Chun Tseng and Chi-Chung Chen (2009); YU Hao-Wei et al. (2009); (Peter et al. (2000); Gholub (2007); Ianchovichina (2001); Ahammad H and R.Mi (2005); Othman (2003) and Thomas (2011).

Sharing was positive and significant impact on forest land that used by LMDH members except in BKPH Cipero and BKPH Jatinegara. Share of forest products was received by LMDH motivated members of LMDH used the land to cropping and below major forestry tree stands. Land area was utilized by LMDH member was used to calculate the portion or shared of income thinning and final felling. This positive relationship suggested when sharing the received LMDH up demand for forest land use would go up, otherwise when sharing was received fell, demand for forest land used also fell, as the relationship between income and demand for land in the theory of demand. As previous research conducted Sunderlin, et al., (2005), Khalil, et al., (2008) and Sikor and Nguyen (2007).

Price elasticity of demand and forest land used by LMDH in KPH Pemalang across BKPH shows $\varepsilon h < 1$, which means that the elasticity of demand was in-elastic. This indicates that the percentage change in the area of forest land used LMDH in KPH Pemalang smaller than the percentage change in prices was proxied by sacrificed income levels be or timber theft. Thus LMDH not responsive to the reduction in the chance to steal wood. Sacrificed incomes were smaller (down one thousand rupiahs) would cause an increase in demand for forest land used under $1m^2$, meaning that the policy Perum Perhutani in reducing illegal logging became ineffective. Therefore, efforts were needed to increase the price elasticity of demand.

The elasticity of demand for forest land used by LMDH in KPH Pemalang and in BKPH (except BKPH Cipero) to the value of the harvest and sharing shows $1 > \varepsilon p > 0$,

which means that land use was a normal (normal goods) or staple goods for LMDH. This means that if the value of the harvest and sharing increased, would drive demand for forest land used has also increased although with a smaller percentage of the increased value of the harvest or sharing. Increased demand for forest land used, would increase value of the harvest and sharing and then supported economic growth in KPH Pemalang.

The elasticity of demand for forest land used by LMDH in BKPH Cipero, value of harvest showed εp> 1, was elastic. This means that the land was a luxury item for LMDH members in BKPH Cipero. Increased in the value of the harvest in BKPH Cipero will drove increase demand of fores land used, this means the value of the harvest could push up demand for forest land used. Interviews with representatives Pesanggem in BKPH Cipero said BKPH Cipero land area was very fertile land for crops, especially maize and also benefits of the corn crop. In each growing season could be used to buy a motorcycle. This was confirmed by the average value of the harvest in BKPH Cipero an average of the highest yields than the other BKPH and also strengthened by sharing coefficient -0.247 indicating that forest land used in BKPH Cipero more due to higher value crops well, was compared with the acceptable sharing. The results of interviews with representatives Pesanggem states that received sharing by LMDH more widely used to build public facilities, however, they stated that if the construction of public facilities needs are met, then allow the sharing was also used for productive ventures.

Implication

The elasticity of demand for land use was in-elastic, less effective for Perum Perhutani policy, especially policies towards reduction of timber theft in order to improve safety and sustainability. Lack of opportunity to steal much of the increase did not affect forest land used by LMDH. The more widely utilized land would increase the value of the harvest and sharing LMDH obtained. Increasing the value of the harvest and sharing would be able to support economic growth in the forest.

Timber theft could not be avoided and or stopped, but as one of the PHBM systems that improved the quality of forest resources, productivity and safety of the forest, Perum Perhutani should still strive to reduce the level of timber theft. Forest areas that are difficult to reach by Ranger, as well as forest city easy access to transportation needed more intensive supervision.

Price or rent land was proxied by opportunity cost as the sacrificed income for timber theft rate was expected to be a scientific contribution of the study. Until now there has been no estimate of the demand of forest land used proxied specific price or rent of land with opportunity cost as the sacrificed income as the level for timber theft.

Souls sharing in PHBM systems included economic, ecological and social. This study only examined the economic aspects alone without including ecological and social aspects, Therefore, it needs to be researched equity share in the PHBM system covering the economic, ecological and social.

Classification of forest land used included production forests, protected forests and conservation forests. Undertake research to protected forests, and forest conservation.

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